ABSTRACT

[0061] A digital demodulator employing a digital differential detection mechanism based on extracting phase differences directly from the I and Q signals after downconversion to zero-IF and image rejection are performed. The phase of the input I and Q signals is determined using the principle that the phase is equivalent to $\arctan\left(\frac{Q}{I}\right)$. A lookup table stores the values of the arctan function preferably in a reduced size format. The size of the lookup table can be reduced significantly by storing arctan values for the first quadrant only (i.e. 0 to 90°) and taking advantage of the fact that the phase values for the other three quadrants can be derived from those of the first with some correction applied depending on the signs of the I and Q input samples. Phase extraction logic is provided that is operative to map the phase into the entire 0 to 360° range of phase values (i.e. $-\pi$ to $+\pi$ radians) based on the signs of the I and Q signals. The phase difference between a current phase value and the previous phase value is then calculated. It is these phase differences that reflect the frequency deviations present in the transmitted signal which represent the original modulating signal. A 'click' removal filter circuit is provided to remove the discontinuities in the phase difference output that occur when the 2π radians value is crossed.